

REMARKS

This application has been reviewed in light of the Office Action dated December 30, 2003. Claims 1-14 remain pending. Claims 1, 2, 5-9, and 12 are in independent form. Favorable reconsideration is requested in view of the following comments.

Claims 1-4, 6, 9 and 12-14 have been indicated as being allowable in the Office Action. The Examiner is thanked for allowing those claims.

The Office Action required an indication that Claims 15-17 have been cancelled, in a listing of the claims. A listing of the claims, including canceled Claims 15-17, is set forth above, in accordance with this requirement.

In the Office Action, Claims 5 and 7 were rejected under 35 U.S.C. §102(e) as being anticipated by U.S. Patent No. 5,728,435 (Geis et al.).

Independent Claim 5 is directed to an electron-emitting device comprising a carbon film composed mainly of carbon, and an electrode electrically connected to the carbon film. Sulfur is contained in the carbon film in a ratio of 5 mol% or less with respect to carbon.

Independent Claim 7 is directed to an electron-emitting device comprising a pair of electroconductors disposed on a substrate, and a pair of films connected to the pair of electroconductors, respectively, disposed with a gap therebetween and containing carbon as a main component. Sulfur is contained in the films in a ratio of 5 mol% or less with respect to carbon.

A notable feature of Claims 5 and 7 is a sulfur content of 5 mol% or less with respect to carbon. According to an aspect of the present invention to which those claims relate, such a content advantageously provides stable electron emission characteristics.

The Office Action relies on Fig. 3 of Geis et al. in support of the rejection of Claims 5 and 7. As pointed out in the Response to Office Action filed on September 5, 2003, Fig. 3 depicts an arrangement in which a cathode 10 is a set of electron-emissive pedestals 40 with sharpened tips. Pedestals 40 are interconnected by way of an electrically conductive layer 42. Items 44 and 46 represent an electronegative-matter layer and an electropositive-metal layer (Col. 7, lines 48-56). Col. 4, lines 27-39 states that carbon along a surface 14/16 (Figs. 1a-1d) preferably consists substantially of diamond, and that the diamond can be conductively doped with sulfur. The sulfur is used in Geis et al. merely as a dopant for making diamond electrically conductive.

The Office Action alleges that “[In Geis et al., t]he outermost layer of the cathode tip 40 is composed of diamond but is doped with sulfur, in a percentage less than 5%, to provide conductivity.” However, in Applicants’ view, nothing has been found, or pointed out, in Geis et al. that would teach or suggest an electron-emitting device comprising a film, in the case of Claim 5, or a pair of films, in the case of Claim 7, including carbon as a main component, wherein sulfur is contained therein in a ratio of 5 mol% or less with respect to carbon.¹ Therefore, Geis et al. cannot anticipate Claims 5 and

^{1/} Geis et al. therefore cannot achieve the above-mentioned advantages attained by Applicants’ invention.

7 since it is well established that “[a] claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference.” MPEP § 2131.01 (citation omitted).

Accordingly, Claims 5 and 7 are each believed to be clearly patentable over Geis et al., and withdrawal of the rejection of that claim is respectfully requested.

If the Examiner refuses to withdraw that rejection after considering the foregoing remarks, he is respectfully requested to point out specifically where in Geis et al. he believes there is a teaching of a sulfur content in a ratio of 5 mol% or less with respect to carbon.

Claims 8, 10 and 11 were rejected under 35 U.S.C. §102(e) as being anticipated by U.S. Patent 5,986,389 (Tsukamoto).

Independent Claim 8 is directed to an electron-emitting device comprising a pair of device electrodes disposed on a substrate, an electroconductive film connected to the pair of device electrodes and having a first gap between the pair of device electrodes, and a film containing carbon as a main component. The carbon film is disposed on the electroconductive film and has a second gap, located within the first gap. The second gap is narrower in width than the first gap. Sulfur is contained in the carbon film in a ratio of 5 mol% or less with respect to carbon.

A notable aspect of the invention to which Claim 8 relates is that a sulfur content in a carbon film is at least larger than 0 mol%, and is 5 mol% or less. Col. 6, lines 13-19 of Tsukamoto, relied on in the Office Action, refers to a device comprising a substrate 1, electrodes 2 and 3, electroconductive thin films 4 and 5, and an electron-

emitting region 6. Col. 9, lines 10-20 refers to a Fig. 1G depicting “additional films 7” formed on a border of an electron-emitting region and a lower potential side electroconductive thin film and on that of an electron-emitting region and the higher potential side electroconductive thin film to provide additional resistance. Films 8 of carbon are employed in an activation process. In Fig. 1H, additional films 7 for providing an additional resistance and corresponding films 8 of carbon or a carbon compound are laid conversely relative to those of Fig. 1G.

Again, MPEP § 2131.01 clearly states that a claim is anticipated only if each and every element of the claim is found, expressly or inherently, in a single prior art reference. It is respectfully submitted that nothing in Tsukamoto would teach or suggest an electron-emitting device as set forth in Claim 8, in which sulfur is contained in a carbon film in a ratio of 5 mol% or less with respect to carbon, and therefore Tsukamoto cannot anticipate Claim 8.

Accordingly, Claim 8 is deemed to be clearly patentable over Tsukamoto, and withdrawal of the rejection of that claim therefore is respectfully requested.


If the Examiner refuses to withdraw that rejection after considering the foregoing remarks, he is respectfully requested to point out specifically where in Tsukamoto he believes there is a teaching of a sulfur content in a ratio of 5 mol% or less with respect to carbon.

Claims 10 and 11 each depend from Claim 8, and also are believed to be patentable over Tsukamoto, at least for the reason that each claim depends from a patentable base claim.

In view of the foregoing remarks, Applicants respectfully request favorable reconsideration and early passage to issue of the present application.

Applicants' undersigned attorney may be reached in our New York office by telephone at (212) 218-2100. All correspondence should continue to be directed to our below listed address.

Respectfully submitted,



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